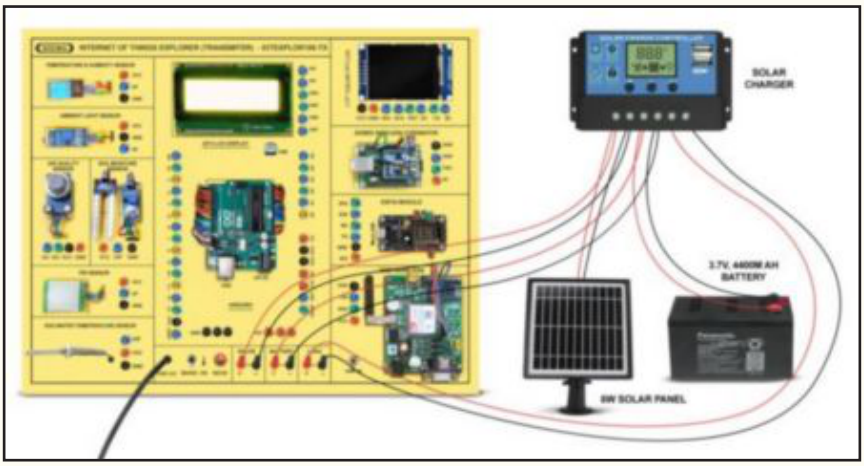
INTERNET OF THINGS EXPLORER
MODEL-IOTEXPLORER100

This trainer has been designed with a view to provide practical and experimental knowledge of Internet of Things (IOT) with Sensors programing with Raspberry and Arduino IOT Boards.



SPECIFICATIONS

Following Parts and Modules are assembled on Single PCB of size - 18 Inch x 15 Inch

A. Transmitter Node Section

1. Arduino Microcontroller Board

1. Arduino Uno Microcontroller board based on the ATMEGA328P
2. 14 Digital Input / Output pins (of which 6 provide PWM output)
3. 16 MHz Ceramic Resonator
4. USB Port
5. Power Jack – 9V DC, 1A
6. 5 Analog Inputs and 3 Digital Outputs and one I2C Channel to support OTA

2. Sensors:

1. Temperature and Humidity– DHT11
2. Air Quality Sensor – Mq135
3. Soil Moisture Sensor
4. Ambient Light Sensor - LDR
5. Soil / Water Temperature Sensor – RTD100
6. PIR Sensor

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Dealer:-

3. Modules and Hardware:

1. 1.77" Color TFT LCD
2. 20 X 4 - LCD Display
3. Solar Panel 6 Watt
4. DC Battery - 3.7V / 4400mAH
5. Solar Charger
6. 2 mm interconnection Sockets
7. Excitation accessories for each sensor
8. Light source/Torch for photovoltaic and LDR
9. Cigaratte lighter for Air Quality Sensor

4. Gateway & Nodes

1. GSM IoT Gateway - Quad-Band 850/900/1800/1900 MHz with GPRS multi-slot class to be Controlled via AT commands
2. IoT Node : Wireless 2.4GHz Zigbee Module

B. Receiver Base Station Section

Following Parts and Modules are assembled on Single PCB of size - 18 Inch x 15 Inch

1. Raspberry Microcontroller Board – Pi-4

1. Processor : 64bit, ARMv7
2. RAM - 1 GB
3. Memory - 32GB
4. OS: Open Source Linux
5. Connectivity:
   Dual-Band 2.4/5.0 GHz Wireless LAN
   Bluetooth 5.0, Gigabit Ethernet
   USB Interface – USB 2.0 – 2 Ports, USB 3.0 – 2 Ports,
6. Video and Sound
   2 × micro HDMI Interface ports (up to 4Kp60 supported)
7. Power - 5V, 3A DC via USB-C Connector

2. Modules and Hardware:

1. 20 X 4 - LCD Display
2. Driver for Stepper and DC Motor
3. Stepper Motor
4. DC Motor
5. RTC Module
6. 4-20mA input Module
7. RS232 Module
8. RS485 Module
9. 2 mm interconnection Sockets

Accessories

1.	Memory card	:	32 GB SD Card
2.	USB Cable	:	1 No
3.	Ethernet Cable	:	1 No
4.	Micro USB to USB cable for ESP32	:	1 No
5.	RS485 to USB TTL Connector	:	1 No
6.	RS232 to USB Connector	:	1 No
7.	HDMI Cable	:	2 No
8.	3V Coin for RTC	:	1 No.
9.	Solar Panel with Battery Bank - 3.7V/4400mAH	:	1 No
10.	Power Supply Adaptor	:	+5V DC, 3A - USB C Connector Power Jack – 9V DC, 1A
11.	Jumper wires	:	50 Nos.
12.	Pen Derive with Software, Library, Driver, Codes, Soft Copy of Manual & Mobile App: 16 GB		
13.	Printed Practical Manual	:	1 No.
14.	E-Books for IOT Subject	:	10 Nos. in PDF Format
15.	Mp4 Video Class for IOT Subject	:	40 Nos
16.	Excitation accessories for each sensor		
17.	4-20 mA current source		
18.	Online Cloud/Server Services for 2 years on Our Sigma Server		

Cabinet and PCB

The complete circuit diagram is screen printed on component side of the PCB with circuit and Parts at the same place. The PCB with components on front side is fitted in elegant wooden box having lock and key arrangement. The acrylic cover is fitted on PCB to safeguard parts. It works on 230 V AC Supply.

EXPERIMENTS

A. Theory Experiments for Raspberry PI 4

1. To understand theory and working of Raspberry
2. To understand Operating System for Raspberry
3. To understand Communication Protocols - UART, I2C, SPI, RS232 and Rs485.
4. To understand USB Interface for Raspberry PI
5. To understand Ethernet Cable Interface for Raspberry PI
6. To understand micro SD Card Interface for Raspberry PI
7. To understand that how to connect 1.77" Color TFT LCD to Raspberry PI.
8. To understand that how to connect 20 x 4 LCD Display to Raspberry PI
9. To understand what is OTA and how to deploy OTA software update on Raspberry Pi
10. To understand theory of I2C Channel
11. To understand theory of Port Forwarding with Static IP

B. Theory Experiments for Arduino Board

12. To understand theory and working of Arduino Operating software.
13. To understand Pin and Connection Diagram of Arduino.
14. To understand USB Interface for Arduino
15. To understand 20 x 4 LCD Display.

C. Theory of GSM, Zigbee and ESP32 Wireless Modules

16. To understand theory and working of GSM Module
17. To understand theory and working of Zigbee Module
18. To understand theory and working of ESP32

D. Theory Experiments for Sensors

19. To understand theory of Air Humidity and Temperature Sensor DHT11
20. To understand theory of Air Quality Sensor Mq135
21. To understand theory of Soil Moisture Sensor
22. To understand theory of Ambient Light Sensor - LDR
23. To understand theory of Soil/Water temperature Sensor RTD100
24. To understand theory of PIR Sensor

E. Practical Experiments

25. To determine Air Humidity & Temperature using DHT11
26. To measure Air Quality using Sensor Mq135
27. To measure Soil Moisture using Soil Moisture Sensor
28. To detect the presence of Ambient Light using Photo Sensor LDR
29. To measure Soil / Water Temperature using RTD 100
30. To detect motion using PIR sensor
31. To control Stepper Motor using Motor Driver
32. To control DC Motor using Motor Driver
33. To charge Battery using Solar Panel

F. Physical Layer Protocol Experiments

34. To determine time using RTC Module
35. To demonstrate 4-20mA input Module
36. To demonstrate RS232 Protocol
37. To demonstrate RS485 Protocol
38. To demonstrate GSM Protocol
39. To demonstrate Ethernet Protocol

G. Application Layer Protocol Experiments

40. To demonstrate MQTT Protocol
41. To demonstrate CoAP Protocol
42. To demonstrate HTTP Protocol
43. To demonstrate FTP Protocol

H. Server, Cloud Configuration, IOT Gateway, Nodes and Mobile App Experiments

44. To send Sensors data using Zigbee Wireless Node to Main Base IOT Receiver
45. To send Sensors data by SMS to Mobile using GSM IOT Gateway
46. To send and display Sensors Data in a server Web Page using HTTP, Java and PHP Code
47. To send Sensors data to website webpage and store them into MySQL Server
48. To receive and show Sensors data on Android based Mobile App